



Printed Pages : 3

ME – 408

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 4048

Roll No.

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B. Tech.

(SEM. IV) EXAMINATION, 2006-07

APPLIED MECHANICS

Time : 2 Hours]

[Total Marks : 50

- Note : (1) Attempt *all* the questions.
(2) Assume suitably the missing data, if any.

1 Attempt any **four** parts of the following : **3.5×4**

- a) Explain engineering stress and strain, true stress and strain.
- b) A circular rod of diameter 20 mm and 500 mm long is subjected to a tensile force of 45 kN. The modulus of elasticity for steel may be taken as 200 kN/mm². Find stress, strain and elongation of the bar due to applied load.
- c) Find the modulus of elasticity for a rod, which tapers uniformly from 30 mm to 15 mm diameter in a length of 350 mm. The rod is subjected to an axial load of 5.5 kN and extension of the rod is 0.025 mm.
- d) Define and explain the terms : longitudinal strain, lateral strain, and Poisson's ratio.
- e) What do you understand by 'An element in a state of simple shear'?

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[Contd...

- f) A bar of uniform cross section A and length L is suspended from top. Find the expression for extension of the bar due to self weight only if Young's modulus is E and unit weight of the material is Y .

2 Attempt any **two** parts of the following : **6×2=12**

- a) A bar of 30 mm diameter is subjected to a pull of 60 kN. The measured extension on gauge length of 200 mm is 0.1 mm and change in diameter is 0.004 mm. Calculate Young's modulus and bulk modulus.
- b) At a certain point in a strained material, the stresses on two planes, at right angles to each other are 20 N/mm² and 10 N/mm² both tensile. They are accompanied by a shear stress of a magnitude of 10 N/mm². Find the location of principal planes and evaluate the principal stresses.
- c) A water main 80 cm diameter contains water at a pressure head of 100m. If the weight density of water 9810 N/m³, find the thickness of the metal required for the water main. Given the permissible stress as 20 N/mm².

3 Attempt any **two** parts of the following : **6×2=12**

- a) A cantilever carries a uniformly distributed load of 1 kN per metre for a length of 4 meters from its supported end and a point load of 3 kN at the free end at a distance of 6 m from the support. Draw the shear force and bending moment diagrams.

- b) A rectangular beam 300 mm deep is simply supported over a span of 4 metres. Determine the uniformly distributed load per metre which the beam may carry, if the bending stress should not exceed 120 N/mm^2 . Take $I = 8 \times 10^6 \text{ mm}^4$.
- c) A thin tube of length L , diameter d and weight density w per unit volume is used to transmit the torque. The maximum permissible stress for the shaft material is τ . Determine the torsional strength to weight ratio.

4 Attempt any **two** parts of the following : **6×2=12**

- a) A flat bar 120 mm wide and 12 mm thick carries an axial pull of 120 kN. A 12 mm diameter hole is punched with its centre at a distance of 36 mm from the axis of the bar. Find the maximum and minimum stresses at the weakest section.
- b) A beam 3 m long, simply supported at its ends, is carrying a point load w at the centre. If the slope at the ends of the beam should not exceed 1° , find the deflection at the centre of the beam.
- c) A column of timber section 15 cm x 20 cm is 6 m long both ends being fixed. If the young's modulus for timber = 17.5 kN/mm^2 , determine buckling load.